Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– V (New) EXAMINATION – WINTER 2019

Subject Code: 2151705 **Date: 04/12/2019**

Subject Name: Process Control Systems

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	What are the performance criterions to design a control system?	**03**
	(b)	Explain in brief the interacting and non-interacting processes with example.	**04**
	(c)	Give out the guidelines for digital implementation of a PID controller in detail.	**07**
Q.2	**(a)**	Draw and explain the step response of a PI controller.	**03**
	(b)	What causes inverse response? Explain with mathematical arguments.	**04**
	(c)	What is discrete time control? Explain ZOH and sampling concept for discrete time control.	**07**
		OR	
	(c)	Explain two position controller with suitable waveform. Show the effect of neutral zone on controller output.	**07**
Q.3	**(a)**	What is self-regulation? Explain with an example.	**03**
	(b)	Explain the terms: 1) Dead Time 2) Offset Error.	**04**
	(c)	For a unity feedback system, process transfer function is given by G(s)=1/s(s+1)(s+5). The controller is of PID mode. Calculate the optimal values of controller parameter based on ultimate cycle method of tuning.	**07**
		OR	
Q.3	**(a)**	What do you mean by velocity and position algorithm for PID controller implementation?	**03**
	(b)	Explain Time Proportional Control with suitable waveform.	**04**
	(c)	A certain thermometer has a time constant of 15 s and initial temperature of T_0= 25°C. It is suddenly exposed to a temperature of 100°C. Determine the rise time i.e. time required to attain 95% of steady state value and the temperature at this time.	**07**
Q.4	**(a)**	Explain open loop ZN tuning method of the PID controller	**03**
	(b)	What is offset in case of proportional control action? How offset can be eliminated?	**04**
	(c)	What is adaptive control? Explain gain scheduling in the context of adaptive control with suitable diagram.	**07**
		OR	
Q.4	**(a)**	Explain ratio control with suitable example.	**03**
	(b)	What are the limitations of cascade control strategy? Discuss on tuning rule for the same.	**04**

	(c)	Design dynamic model for continuous stirred tank heater (CSTH).	**07**

Q.5	**(a)**	Explain the split range control for reactor pressure control.	**03**
	(b)	What is integrator windup? State and explain the ways to deal with the same.	**04**
	(c)	Explain selective control scheme with suitable diagram.	**07**

OR

Q.5	**(a)**	How to derive the parameters of FOPDT model from Process Reaction Curve.	**03**
	(b)	Explain Multi-position controller function with error Vs. controller output relation.	**04**
	(c)	Explain shrinking and swelling concept in the context of drum boiler control.	**07**

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